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For: FLOOR CLEANING APPARATUS

- 1 1. A floor cleaning device for cleaning a floor, the floor cleaner having a
2 front and a rear, the floor cleaner comprising:
3 a scrubber for wetting and cleaning the floor, and
4 a burnisher located to the rear of the scrubber for burnishing the
5 floor,
6 wherein said scrubber comprises a brush having an axis of rotation
7 substantially parallel to the floor and substantially perpendicular to an axis running from
8 the front to the rear of the cleaner.
- 1 2. The cleaner of claim 1 wherein said scrubber brush includes polymeric
2 bristles.
- 1 3. The cleaner of claim 2 wherein said bristles range from 0.1 mm to 0.5 mm
2 in diameter.
- 1 4. The cleaner of claim 1 wherein a flexible blade for collecting bulk water is
2 positioned to contact the floor between the scrubber and the burnisher.
- 1 5. The cleaner of claim 4 further including a vacuum source for applying
2 suction to a portion of the floor in front of said flexible blade to collect liquid gathered by
3 said blade.

1 6. The cleaner of claim 5 further comprising a second flexible blade
2 positioned in front of, and spaced apart from said first flexible blade, the vacuum source
3 applying said suction to the space between the first and second blades.

1 7. The cleaner of claim 1 wherein the burnisher includes a burnisher pad and
2 the scrubber includes a scrubber brush, the burnisher and the scrubber being positioned
3 relative to one another such that a front-most point of the burnisher pad is located less
4 than 40 cm from a rear-most point of contact of the scrubber brush with the floor.

1 8. The cleaner of claim 1 wherein the burnisher includes a burnisher pad and
2 a motor for spinning the burnisher pad at a speed at or above 1000 rpm.

1 9. The cleaner of claim 8 wherein the motor is an electric motor.

1 10. The cleaner of claim 1 which further includes a sweeper mounted forward
2 of the scrubber.

1 11. A floor cleaner for cleaning a floor, the floor cleaner having a front and a
2 rear, the floor cleaner comprising
3 a sweeper,
4 a scrubber mounted to the rear of the sweeper for wetting and
5 cleaning the floor, and
6 a burnisher located to the rear of the scrubber for burnishing the
7 floor.

1 12. The cleaner of claim 11 wherein the sweeper comprises:
2 one or more rotating sweeper elements,
3 a hopper spaced from said sweeper elements, and
4 a ramp, connected to said hopper and located between the sweeper
5 elements and the hopper, a portion of the ramp being located under a portion of the
6 sweeping elements.

1 13. A floor cleaner for cleaning a floor, the floor cleaner having a front and a
2 rear, the floor cleaner comprising:
3 a scrubber for wetting and cleaning the floor, and
4 a burnisher located to the rear of the scrubber for burnishing the
5 floor, wherein the distance between the scrubber and the burnisher is no greater than 40
6 cm.

1 14. A floor cleaner for cleaning a floor, the floor cleaner having a front and a
2 rear, the floor cleaner comprising:
3 a scrubber for wetting and cleaning the floor, and
4 a burnisher located to the rear of the scrubber for burnishing the
5 floor, and
6 liquid removal apparatus for removing bulk liquid from the floor,
7 said apparatus located between the scrubber and the burnisher, wherein the point of liquid
8 removal from the floor is located within 25 cm of the burnisher.

1 15. The cleaner of claim 14 wherein the point of liquid removal from the floor
2 is located within 10 cm of the burnisher.

1 16. A method of cleaning and burnishing a polymeric coating on a floor
2 surface comprising scrubbing the floor using a composition comprising water, wherein
3 the scrubbing comprises using a bristled brush and causing the bristles to contact the floor
4 in a substantially straight path and thereafter burnishing the floor.

1 17. A method of cleaning and burnishing a polymeric coating on a floor
2 surface comprising scrubbing the floor using a composition comprising water, permitting
3 the coating to absorb an additional amount of water and burnishing the floor while the
4 coating contains said additional amount of water.

1 18. The method of claim 17 wherein said polymeric coating is hydrophilic.

- 1 19. A method of burnishing a polymeric coating on a floor surface which
- 2 comprises burnishing said coating while the coating is in a softened state.

- 1 20. A method of burnishing a polymeric coating on a floor surface which
2 comprises burnishing said coating while the cating contains substantial absorbed water.

1 21. A cleaner for cleaning a floor comprising
2 a first assembly of components for performing a first cleaning
3 operation on the floor,
4 a second assembly of components for performing a second cleaning
5 operation on the floor,
6 control circuitry, connected to the first and second assemblies,
7 executing in parallel a first program module operating the first assembly and a second
8 program module operating the second assembly.

1 22. The cleaner of claim 21 wherein the first program supplies data to the
2 second program, and the second program modifies the operation of the second assembly
3 based on said data.

1 23. The cleaner of claim 21 wherein the control circuitry comprises at least two
2 processors, one processor executing the first program and the second processor executing
3 the second program.

1 24. The cleaner of claim 21 wherein the first assembly includes a scrubber and
2 the second assembly includes a burnisher.

1 25. The cleaner of claim 24 further comprising:
2 a third assembly of components for sweeping the floor, wherein the control
3 circuitry is further connected to the third assembly and executes, in parallel with the first
4 and second program modules, a third program module operating the third assembly.

1 26. A cleaner for cleaning a floor comprising
2 a first assembly of components for performing a first cleaning
3 operation on the floor,
4 a second assembly of components for performing a second cleaning
5 operation on the floor,
6 control circuitry, connected to the first and second assemblies,
7 executing in parallel a first and second program modules,
8 the first program module comprising a first plurality of instructions
9 for controlling the operations of the first and second assemblies and coordinating among the
10 operations of the first and second assemblies,
11 the second computer program module comprising a second plurality
12 of instructions for controlling the operations of the first and second assemblies,
13 wherein the first plurality of instructions includes an instruction for
14 supplying a command from the first program module to the second program module, the
15 command requiring performance of a sequence of actions by at least one of the first and
16 second assemblies, wherein the first program module, after executing the instruction for
17 supplying the command, executes other instructions independent of performance of said
18 sequence of actions,
19 the second plurality of instructions including a sequence of
20 instructions for causing said at least one of the first and second assemblies to perform said
21 sequence of actions, the second program module executing the sequence of instructions
22 independent of the first program module.

1 27. The cleaner of claim 26 wherein the control circuitry comprises at least two
2 processors, one processor executing the first program module and the second processor
3 executing the second program module.

1 28. The cleaner of claim 26 wherein the first assembly includes a scrubber and
2 the second assembly includes a burnisher.

1 29. The cleaner of claim 28 further comprising:
2 a third assembly of components for sweeping the floor, wherein the control circuitry
3 is further connected to the third assembly,

4 wherein the first program module further comprises a third plurality of instructions
5 for operating the third assembly and coordinating among the operations of the third
6 assembly, and the first and second assemblies,

7 wherein the second computer program module further comprises a fourth plurality
8 of instructions for operating the third assembly,

9 wherein the second plurality of instructions includes an instruction for supplying a
10 second command from the first program module to the second program module, the
11 command requiring performance of a second sequence of actions by the third assembly,
12 wherein the first program module, after executing the instruction for supplying the second
13 command, executes other instructions independent of performance of said second sequence
14 of actions,

15 the second plurality of instructions including a second sequence of instructions for

16 causing the third assembly to perform said second sequence of actions, the second program
17 module executing the second sequence of instructions independent of the first computer
18 program module.

1 30. A cleaner comprising
2 a first assembly of components for performing a first cleaning
3 operation,
4 a second assembly of components for performing a second cleaning
5 operation,
6 control circuitry, connected to the first and second assemblies,
7 coordinating an operation of the first assembly relative to an operation of the second
8 assembly based on a distance traveled by said cleaner.

1 31. A floor cleaner comprising:

2 a sweeper assembly including at least one retractable, rotatable
3 sweeper brush for sweeping the floor;

4 a scrubber assembly including at least one retractable, rotatable
5 scrubber head, a source of cleaning fluid, and a vacuum source for cleaning the floor;

6 a burnisher assembly including at least one retractable, rotatable
7 burnishing pad for burnishing the floor and,

8 a control system receiving as an input at least a cleaning mode
9 command, the control system including circuitry configured, in response
10 to the cleaning mode command, to automatically provide signals which:
11 cause the sweeper brush to rotate and lower,
12 cause the scrubber head to rotate and lower,
13 cause the source of cleaning fluid and the vacuum source to operate, and,
14 cause the burnishing pad to rotate and lower in accordance with a
15 predefined sequence.

1 32. The cleaner of claim 31 further including at least one rotatable drive wheel

2 and wherein the control system further includes circuitry configured to cause the drive
3 wheel to rotate automatically in response to receiving a drive command to engage the drive
4 wheel.

1 33. The floor cleaner of claim 32 of which the control system further includes
2 circuitry configured, in response to the absence of either the cleaning mode command or
3 the drive command, to provide signals which first cause the source of cleaning fluid to
4 turn off and then, after a time delay, cause the vacuum source to turn off, and cause the
5 scrubber head to stop and raise.

1 34. The floor cleaner of claim 31 in which the control system circuitry, in a
2 predefined sequence, provides signals which cause the sweeper brush, the scrubber head
3 and the burnishing pad to raise and stop, and cause source of cleaning fluid and the
4 vacuum source to stop operation automatically in response of the absence of the cleaning
5 mode command.

1 35. A floor cleaner comprising:
2 a retractable sweeper assembly including:
3 at least one rotatable sweeper brush,
4 a sweeper brush motor for rotating the sweeper brush, and
5 a sweeper assembly motor for raising and lowering the sweeper
6 brush;
7 a retractable scrubber assembly including:
8 at least one rotatable scrubber head,
9 a squeegee assembly proximate the scrubber head,
10 a scrubber head motor for rotating the scrubber head,
11 a scrubber assembly motor for raising and lowering the scrubber
12 head and the squeegee assembly,
13 a cleaning fluid pump for supplying cleaning fluid proximate the scrubber
14 head, and a vacuum source including an inlet proximate the scrubber head;
15 a retractable burnisher assembly including:
16 at least one rotatable burnishing pad,
17 a burnishing pad motor for rotating the burnishing pad, and
18 a burnisher assembly motor for raising and lowering the burnishing
19 pad; and
20 a control system including circuitry configured, upon command, to
21 automatically, selectively energize and deenergize the sweeper brush motor, the sweeper
22 assembly motor, the scrubber head motor, the scrubber assembly motor, the cleaning

- 23 fluid pump, the vacuum source, the burnishing pad motor, and the burnisher assembly
- 24 motor in accordance with preselected sequence.

1 36. A floor cleaner comprising:
2 at least two retractable head assemblies each including at least one
3 rotatable head; and
4 a control system including circuitry configured to automatically provide
5 signals for lowering both head assemblies and rotating both heads upon the
6 receipt of a command and in accordance with a predefined sequence.

1 37. The floor cleaner of claim 36 in which one said retractable head assembly
2 includes a scrubber brush, a squeegee assembly proximate the scrubber brush, a source of
3 cleaning fluid, and a vacuum source.

1 38. The floor cleaner of claim 37 in which the control system circuitry provides
2 signals which cause the scrubber brush and the squeegee assembly to lower, and which
3 begin the operation of the scrubber brush, the source of cleaning fluid, and the vacuum
4 source automatically upon the issuance of only a single command.

1 39. The floor cleaner of claim 37 in which the control system circuitry
2 provides signals which cause the scrubber brush and the squeegee assembly to raise and
3 which stop the operation of the scrubber head, the source of cleaning fluid, and the
4 vacuum source automatically upon the issuance of only a single command.

1 40. The floor cleaner of claim 39 in which the predefined sequence includes
2 providing signals which stop the operation of the source of cleaning fluid before the
3 squeegee assembly is raised and the vacuum source is turned off.

1 41. A floor cleaner for cleaning a floor comprising:
2 a scrubber for wetting and cleaning the floor, and
3 a member being mounted for movement from a first position to a second
4 position, wherein in the first position the member prevents cleaning liquid from the
5 scrubber brush to fall on the floor and in the second position the member prevents the
6 cleaning liquid from the scrubber brush to splash against at least a portion of the cleaner.

1 42. A floor cleaner for cleaning a floor comprising:
2 a scrubber for wetting and cleaning the floor,
3 a squeegee blade, and
4 a squeegee mount for housing the squeegee blade, wherein the squeegee
5 mount includes a groove for slidably mounting the squeegee blade.